

Liquid Nitrogen Pump Skid Package  
Procurement Requirements  
A Katrina Mitigation Project  
at the  
High Pressure Gas Facility  
Project Number  
KTM004-1

PREPARED BY:

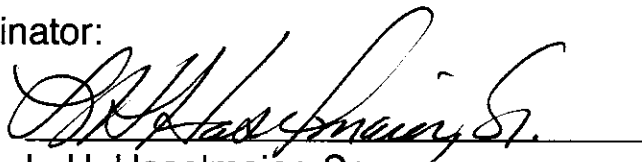
NASA/EA32

JOHN C. STENNIS SPACE CENTER  
SSC, MS 39529

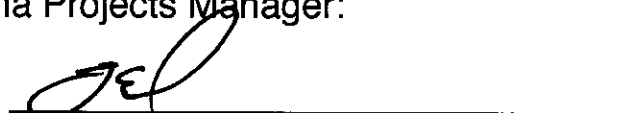
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## 1.0 REQUIREMENTS

### 1.1 SUMMARY

The scope of work to be performed in this procurement consists of the fabrication, delivery to SSC and, after installation by others, activating two liquid nitrogen pump skids identical in all physical and functional respects to an existing development skid already installed and in daily operation at SSC's High Pressure Gas Facility (HPGF).

The existing pump skid was developed under NASA Grant and Cooperative Agreement number NNS07AA36A. The existing pump skid was designed by ACD (the named partner in the Cooperative Agreement) of Santa Ana, CA and was fabricated on behalf of ACD by Pittsburgh Cryogenic Services, Inc. of Imperial, PA. The objective of the CA was to identify a viable pump skid configuration, fabricate that pump skid and validate its performance to insure it met all objectives of the Cooperative Agreement.

After preliminary testing at ACD, the cooperatively developed pump skid was installed at the HPGF and has successfully undergone extensive testing and has been commissioned for and remains in daily service. At this point the development pump skid is the primary means of providing nitrogen to SSC's site wide gas distribution system. Two additional pump skids are required to satisfy requirements for pumping capacity and operational redundancy as defined in the Katrina Mitigation objectives.

Facility infrastructure at SSC and designs for additional infrastructure required to accommodate the additional pump skids are based on the specific configuration and capability of the development pump skid. The precise configuration and similitude of the pump skids to be provided is critical to the success of the Project. The controls system developed, fabricated and installed by NASA must be able to seamlessly integrate with the two additional pump skids. The maintenance and operating procedures established for the initial pump skid must be appropriate for the additional skids without modification or revision.

The provider shall exactly replicate the development skid configuration so that all equipment provided (motors, drives, gear reducers, cold ends, valves, tubing, fittings, instruments, etc.) conforms to the configuration of the original pump skid. Even minor changes such as the installation point of a valve, transducer or thermocouple may result in control system incompatibility.

## 1.2 General Description

The requirement is for two each ACD 5HDSLS (quintuplex) cryogenic reciprocating pumps further described as follows:

- 150 HP 480V, 60 HZ, 3PH, 170 FLA main motor
- 2" bore X 2.25" stroke cold ends rated for 15KPSI service (5 each)
- Dry sump Model HD main drive rated for 1500 HP
- 4.9:1 gear reducer rated for 2000 HP
- Paraflex-type coupling rated for 450 HP
- Lube oil module
- Cryogenic Boost Pump p/n 3405948-320CE
- Galvanized skid support frame
- Surge Suppression Chamber rated for not less than 5KPSI service

Each skid shall provide 45 GPM liquid nitrogen at 4500 PSIG.

All piping, cold ends, tubing, instruments, boost pump, etc. that contact the product being pumped shall be cleaned for commercial oxygen service per PCP-018.

Certain components may be provided as GFE to the provider. All GFE items shall be identified as such in the technical proposal.

The installation of the pump skids will be by others. The supplier shall provide on site support during activation.

## 2.0 Technical Submittal

The Technical Proposal shall include complete drawings of the required pump skids in same format as were the original drawings produced during the execution of the Cooperative Agreement. The drawing package requires approval by NASA prior to contract award. No changes may be made to the drawings (including substitution of instruments or components) at any time after contract award without specific approval of the Contracting Officer.

The Technical Proposal shall include a list for recommended spare parts.

### 3.0 Warranty

The pumps skids including all subcomponents (except those items identified as GFE) shall be warranted by the provider for a minimum of one year after installation and activation at SSC.

### 4.0 Cleaning, Packaging and Shipping

All tubing valves, fittings, flex adapters, cold ends, and instruments that represent wetted parts (contact nitrogen) shall be cleaned per PCP-018. All cleaned parts shall be protected with closures to preserve cleaning by the provider. Upon arrival at SSC the pump skids and boost pumps will be purged after which samples will be taken and analyzed for cleanliness. This process was established during the Cooperative Agreement. It will be the responsibility of the provider to re-clean any item not delivered to SSC and validated as clean. All items cleaned by the provider shall be packaged to prevent contamination during shipping or storage. Threaded closures are the preferred method where possible. Bores larger than those that can be closed with threaded fittings shall be identified in the proposal and the method of closure must be approved by the COTR.

All items shipped shall be boxed or crated as necessary to prevent damage or contamination.

All items provided under the Contract shall be FOB to Bldg. 2204, SSC, MS 39529.

### 5.0 Activation Support

The supplier shall provide on site assistance for initial start up and activation testing of the pump skids. That support and travel schedule will be coordinated through the COTR. Installation (electrical, controls and mechanical connection of the pump skid to HPGF infrastructure) will be the responsibility of others.

### 6.0 Activation Testing and Approval

After installation each skid will undergo an initial start up at which time the provider shall have a representative on site. Final acceptance of the activation test for each skid will be based on 12 hours of successful operating time that will

be accrued over several pumping cycles. It is anticipated that that this effort can be completed within one week after initial start up. All electrical power, liquid nitrogen, purge/actuation pressure gasses and system controls necessary for activation testing will be provided by NASA.